

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A device for detecting target molecules comprising:

a substrate

a film bulk acoustic piezoelectric resonator (FBAR) having edges, comprising piezoelectric material sandwiched between and coupled to;

a pair of electrodes coupled to the piezoelectric resonator; wherein the electrodes have at least one functionalized surface which is opposite to the resonator, wherein the functionalized surface is configured to react with target molecules, which FBAR is attached to the substrate at its edges; and

control circuitry comprising a signal generator configured to apply an excitation signal that includes a plurality of frequencies to the pair of electrodes and processing circuitry to determine the impedance of the resonator as a function of frequency, such that the mass, or the electrostatic charge or both, of the target molecules that have reacted with the functionalized surface causes a detectable change in the frequency response for the layer of the FBAR piezoelectric material and

further comprising a second piezoelectric resonator and an additional pair of electrodes having a non-functionalized surface coupled to the second piezoelectric resonator, wherein the control circuitry is configured to apply the excitation signal to the additional pair of electrodes and to determine a frequency response for the second piezoelectric resonator.

2.-3. (Previously Canceled).

4. (Currently Amended) The device of claim 1, wherein the piezoelectric material is AlN or ZnO resonators comprise film bulk acoustic resonators (FBARs) .

5. (Previously Presented) The device of claim 1, wherein the excitation signal comprises an in-phase signal.

6. (Previously Presented) The device of claim 1, wherein the excitation signal comprises an out-of-phase signal.

7. (Currently amended) The device of claim 1, wherein the excitation signal comprises a time variant, single frequency signal.

8. (Previously presented) The device of claim 1, wherein the excitation signal comprises a mixed frequency signal.

9. (Currently amended) The device of claim 1, wherein the excitation signal comprises a time-variant, mixed frequency signal.

10. (Original) The device of claim 1, wherein the functionalized surface comprises one or more biomolecules configured to bind with the target molecules.

11. (Original) The device of claim 10, wherein the biomolecules comprise biologically active molecules.

12. (Original) The device of claim 10, wherein the biomolecules comprise biologically derivatized molecules.

13. (Original) The device of claim 1, wherein the functionalized surface is functionalized by immobilization of biomolecules on a self-assembly monolayer.

14. (Original) The device of claim 1, wherein the functionalized surface is functionalized by immobilization of biomolecules on an organic membrane.

15. (Original) The device of claim 14, wherein the organic membrane is pre-coated onto the functionalized surface.

16. (Original) The device of claim 14, wherein the organic membrane is chemically derivatized on the functionalized surface.

17. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by silylation.

18. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by acylation.

19. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by esterification.

20. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by alkylation.

21. (Original) The device of claim 1, wherein the functionalized surface is functionalized by direct immobilization of biomolecules on metal.

22. (Original) The device of claim 1, wherein the functionalized surface is functionalized by direct immobilization of biomolecules on a non-metallic inorganic film.

23. (Original) The device of claim 1, wherein the functionalized surface is functionalized by self-assembling biomolecular layers on the functionalized surface.

24. (Original) The device of claim 23, wherein the assembling biomolecular layers comprise amino acid derivatized fatty acids or lipids.

25-30 . (Previously Withdrawn)

31. (New) The device of claim 1, which further comprises a second piezoelectric resonator and an additional pair of electrodes having a non-functionalized surface coupled to the second piezoelectric resonator, wherein the control circuitry is configured to apply the excitation signal to the additional pair of electrodes and to determine a frequency response for the second piezoelectric resonator.